

Coastal Inlets Research Program

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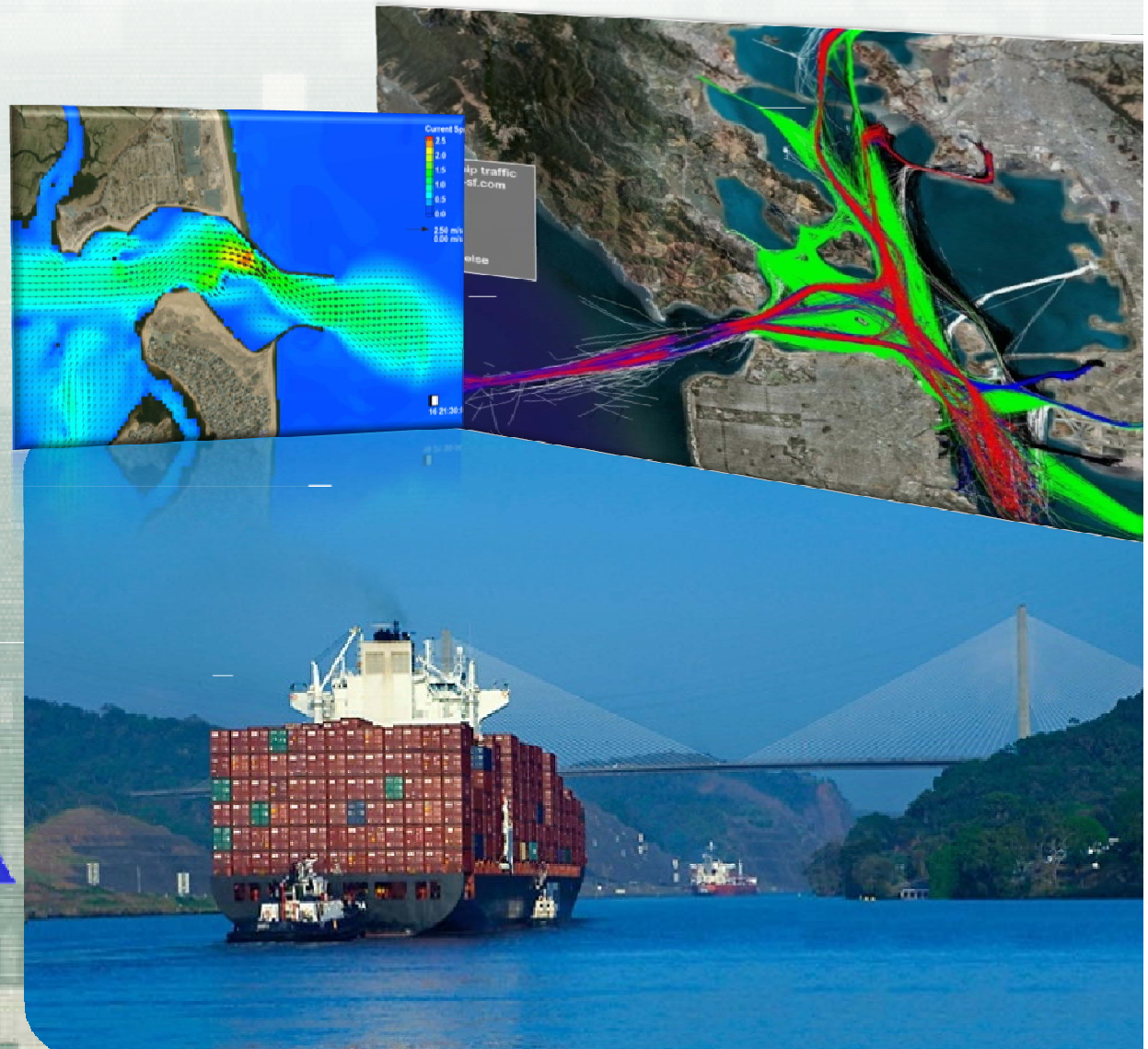
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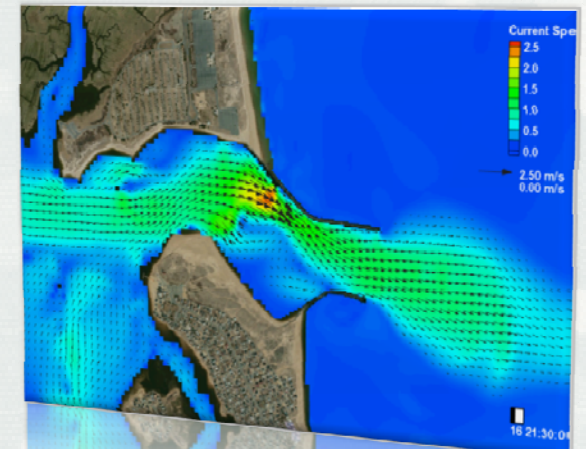


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- Conduct R&D to reduce O&M costs at coastal navigation projects
 - Include inlets, entrances, ports, marinas, harbors, navigation structures, channels and adjacent beaches.
- Develop tools to support O&M practice
 - Provide Districts tools for PCs to evaluate inlets, channels, structures, adjacent beaches, dredging and placement within regional systems.
- Transfer technology and products
 - Guidance documents, Workshops, models and tools, Web site, Wiki-pages, PC software, Web portals, Mobile device apps, video clips.



CIRP Work Units

Program Management and Technology Transfer

Julie Rosati, Mitch Brown

Coastal Modeling System (CMS)

*Alex Sanchez
Honghai Li*

Geomorphic Evolution

Tanya Beck

Inlet Engineering Toolbox

*Ashley Frey
Julie Rosati*

Waves at Navigation Structures

*Lihwa Lin
Zeki Demirbilek*

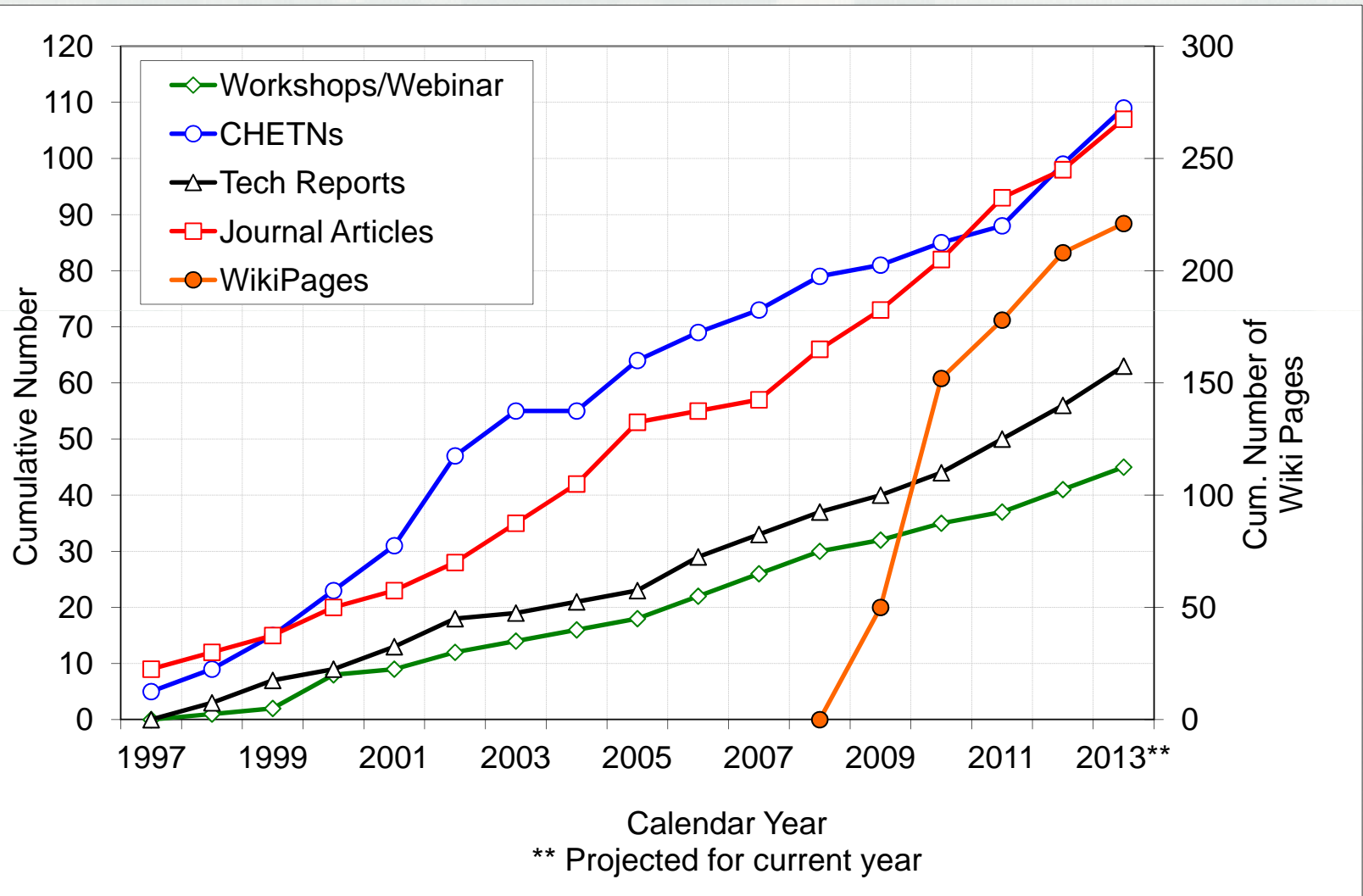
Coastal Navigation Portfolio Management

Ned Mitchell



CIRP Publications and Workshops

Program
Management
and Technology
Transfer





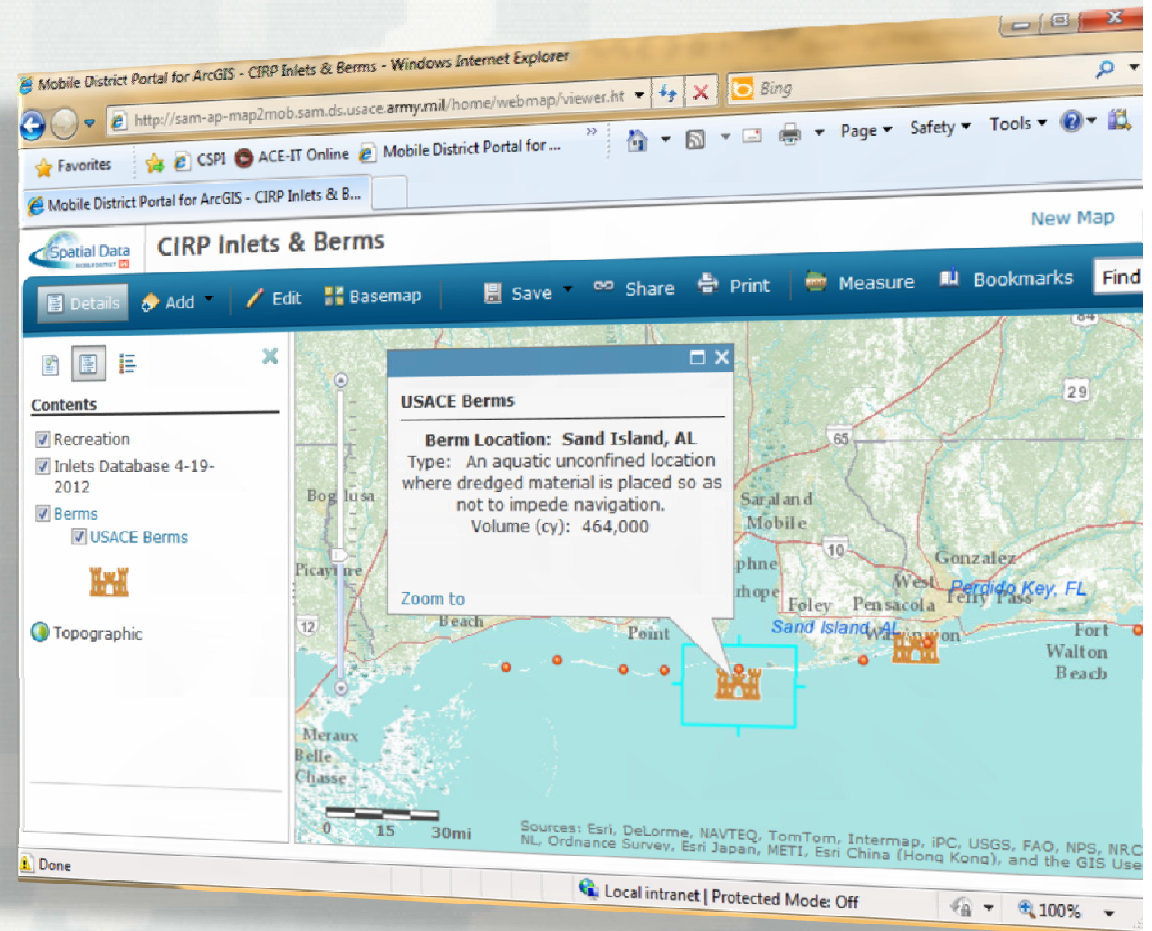
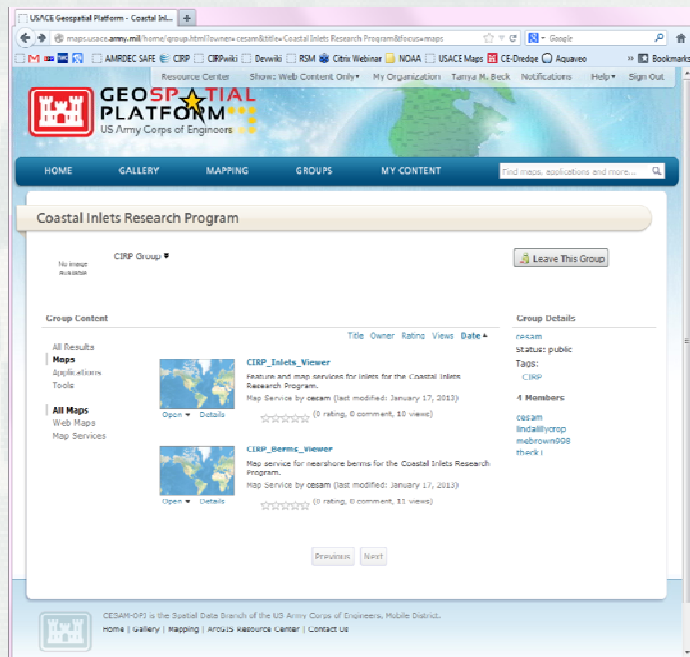
New CIRP Inlets Portal and Interactive Map of CIRP Projects



Program
Management
and Technology
Transfer

Geomorphic
Evolution

Tools are linked to National
Coastal Data Bank (NCDB) and
other data resources





Workshops, Nov98-Mar13



Program
Management
and Technology
Transfer

E & W Coasts, Nov 1998	Avalon, NJ/Redondo Beach, CA	Recent developments in CIRP: ADCIRC & STWAVE
#1 – FSBPA, Feb 2000	Melbourne, FL	Waves, tidal hydrodynamics, tidal inlet circulation
Feb 2001	Orlando, FL	ADCIRC, STWAVE, & ADCIRC/STWAVE linkages
Jan 2002	Biloxi, MS	GIS for coastal and navigation projects
	Vicksburg, MS	SMS Steering Module Workshop
Feb 2003	Ponte Vedra Beach, FL	Hydro Steering Module and sediment transport/ morphology change
May 2003	Clearwater Beach, FL	CS03 Modeling Tidal Inlets
#5 – FSBPA, Feb 2004	New York, NY	Calculating sediment transport/morphology change
Aug 2004		
#6 – FSBPA, Feb 2005		Modeling sediment transport and morphology change, channel infilling
Aug 2005		Modeling System Technology Transfer
#7 – FSBPA, Jan/Feb 2006	Sarasota, FL	Modeling of waves, circulation, sediment transp, and morph. change
Dec 2006	Vero Beach, FL	Empirical and Numerical Techniques for Analyzing Wave Processes
Jan 2007	Ft. Lauderdale, FL	
#9 – FSBPA, Jan 2008	Sarasota, FL	Estuarine Design and Research Network
Jun 2008	Sarasota, FL	Advanced Coastal Modeling System Workshop
Jun 2008	Vicksburg, MS	
#10 – FSBPA, Jan/Feb 2009	Sarasota, FL	1st Annual FSBPA Workshop
#11 – Annual, Dec 2009	Sarasota, FL	Integrated Coastal Inlet Simulation with Applications
May 2010	New Orleans District, LA	Advances in Decision-Support: CMS and CPT
#12 – FSBPA, Feb 2011	Bakersfield, CA	Modeling Inlet Sediment Transport for Tidal Inlets
Aug 2011	San Diego, CA	CMS&GenCode for Regional Sediment Management
#13 NAP, Mar 2012	Philadelphia, PA	Technology Transfer Workshop/Webinar
Jun (2)	Webinars	Two CMS Webinars
Oct 2012	Webinar	GenCade Webinar



13 Years of Annual Workshops

40 Cumulative Workshops

DOTS one-on-one at NAB in Apr13

DOTS one-on-one at NAO FY13

WOTS (wetland) for LRB in FY13

2 Webinars (2 more planned) in FY13

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Coastal Navigation Portfolio Management

Ned Mitchell



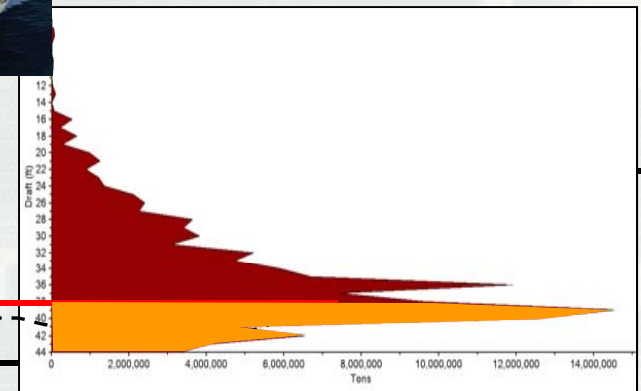
Coastal
Navigation
Portfolio
Management

Focus: develop decision-support tools that provide the USACE with objective, consistent performance metrics for inventory of coastal channels, structures, and other navigation assets.

Channel Portfolio Tool (CPT):

Web-based application that relates navigable depths to cargo most vulnerable to shoaling. Allows for detailed, reach-level analysis as well as regional and national summaries of the waterborne transportation systems supported by Corps navigation projects.

<https://cpt.usace.army.mil>



Coastal Structures Management, Analysis, and Ranking Tool (CSMART):

Web-based application that prioritizes coastal structures according to user-specified criteria and weightings on metrics such as condition rating, commercial tonnage, fish landings, and cruise and ferry passengers. Allows local, regional, and national queries and comparisons.

<https://itlgis01.usace.army.mil/CPT/Silverlight/CSMART>

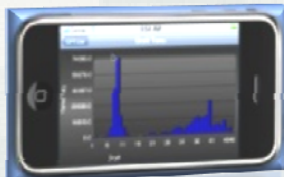
Statements of Need

Coastal Navigation Portfolio Management *FY12 Progress*

Coastal Navigation Portfolio Management

Channel Portfolio Tool (CPT):

- Aligned project inventory with official CWIS codes for future merging with navigation budget data (ongoing in FY13)
- Developed CPT Optimization add-on
 - Extract waterway freight corridor information
 - Develop systems-based strategies for O&M dredge budgeting



CPT-LITE

Coastal Structures Management, Analysis, and Ranking Tool (CSMART):

- Supported Corps Asset Management (AM) initiative and Low-Use Navigation Project PDT
- Matched AM inventory of coastal structures to Project CWIS codes
- Adapted CSMART to include physical condition ratings submitted via AM effort

Structural Condition Rating (SCR)		F	D	C	B	A
Functionality Condition Rating (FCR)	F	1	2	4	5	6
	D	3	7	8	11	13
	C	9	10	14	16	18
	B	12	15	19	21	23
	A	17	20	22	24	25

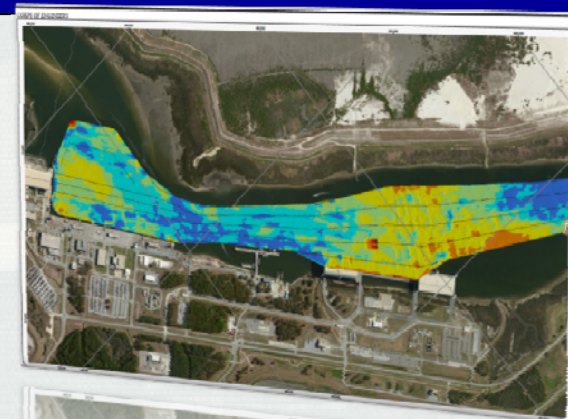
Coastal Navigation Portfolio Management

FY13 Plans

Coastal Navigation Portfolio Management

CPT:

- Integration with 3D Channel Framework (finally!) and Hydro Survey Tool
- Interactive charts within CPT interface
- Paper on systems-based O&M optimization to appear in *Transportation Research Record* (Mitchell, Wang, and Khodakarami; 2013)



CSMART:

- Merging CPT and CSMART
- Interface upgrades and various functionality improvements



Navigation Project Performance via AIS data archive (SON 2012-N-5)

- Paper: *AIS History and Future Improvements in Waterway Management* (Scully and Mitchell, 2013)
- Investigating new R&D applications of AIS archive as a remote sensing technology; can be cross-correlated with other data archives (tides, waves, env. monitoring, etc.)



Statements of Need

Automatic Identification System (AIS) data use in Navigation operations and engineering.
Tracking Number 2012-N-5

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Coastal Modeling System

Coastal Modeling System

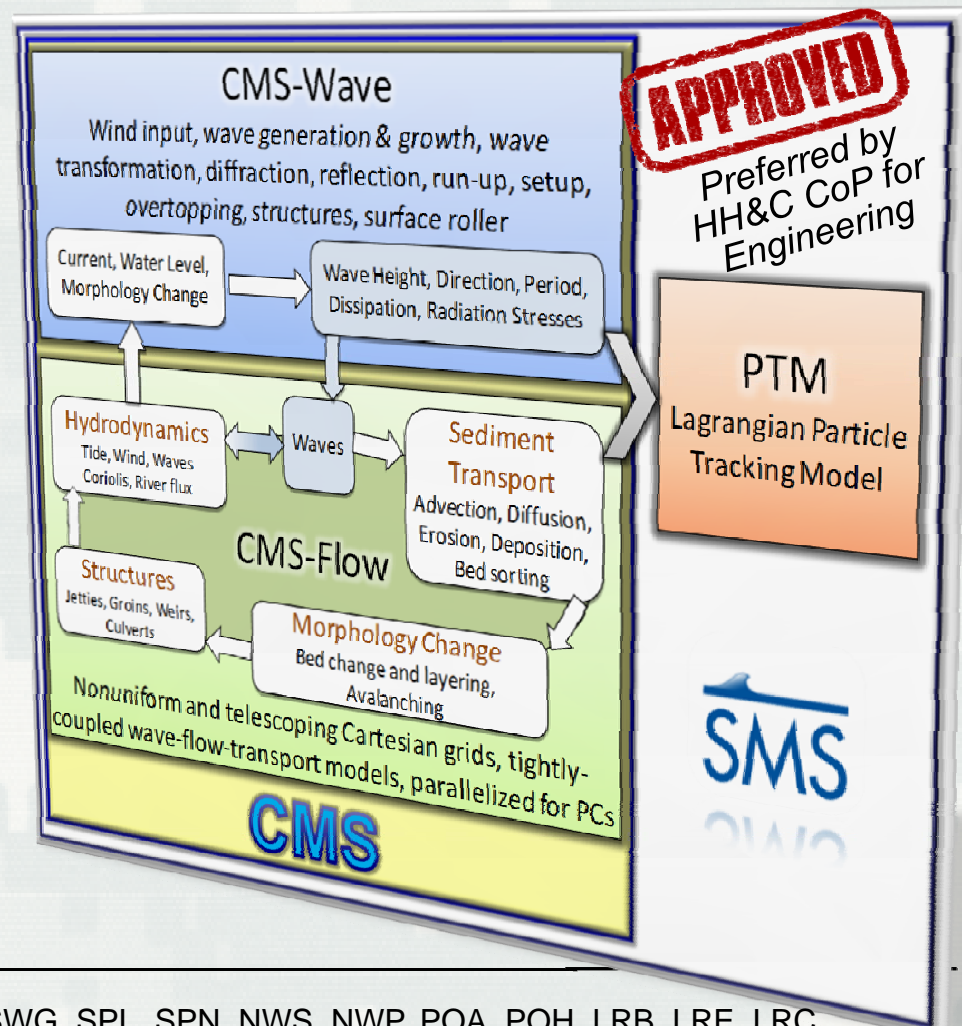
Focus: Develop, advance, and transfer an integrated wave, current, and sediment transport model for **District use** in O&M applications

Coastal Modeling System:

- PC-based
- Verified and validated with hydrodynamic (20 cases) and sediment transport (10 cases) tests
- Focus on channel shoaling, inlet short- and mid-term morphology change
- Operational at 17 Districts*

Statements of Need

Need long-term morphologic evolution predictors
Tracking Number 2008-N-6



Coastal Modeling System

FY12 Accomplishments

Coastal
Modeling
System

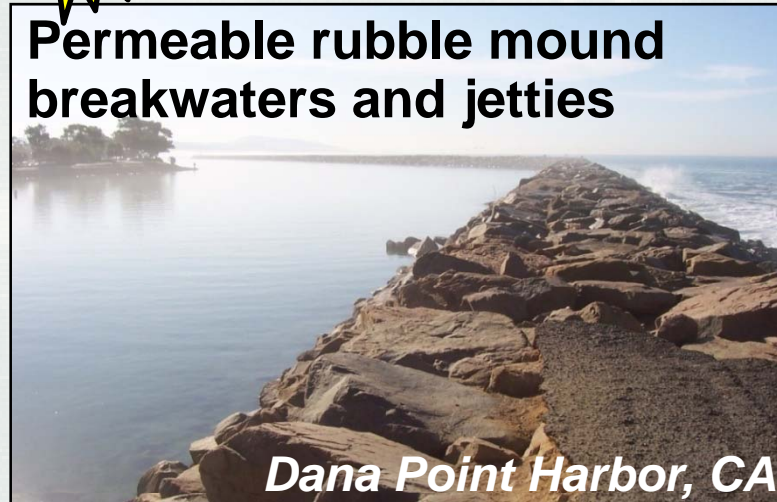


Structures in CMS

Tidal gates



Permeable rubble mound breakwaters and jetties



Dana Point Harbor, CA

Low-crested weirs



◀ Weir Jetty

Rudee Inlet, VA

Culverts



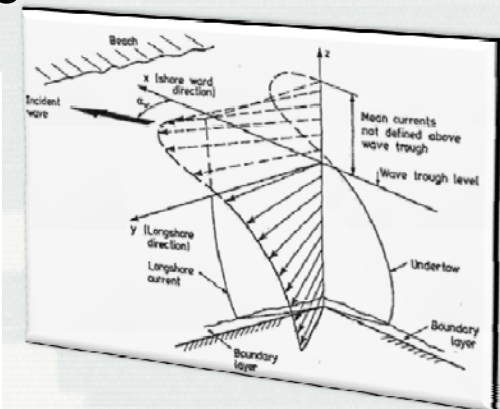
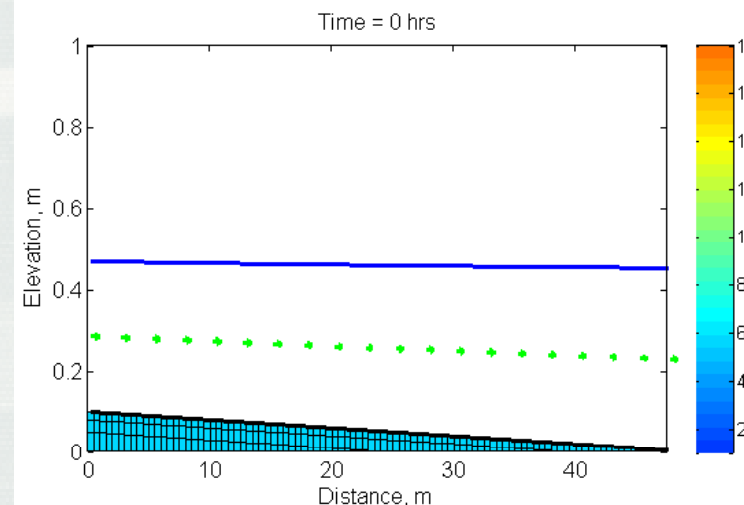
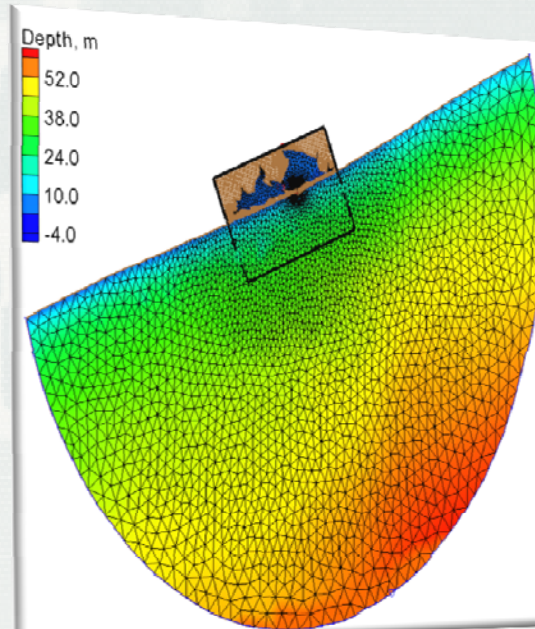
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Engineering

Coastal Modeling System

FY12 Accomplishments

Coastal Modeling System

- Multiple-sized sediment transport and bed layering
- Quasi-3D wave-averaged formulation
 - *Better representation of cross-shore momentum and sediment dispersion, especially significant for nearshore*
- Automated Nesting Boundary Extraction
- Automated Tidal Database Boundary
- Horizontal Coordinate Projection Conversions

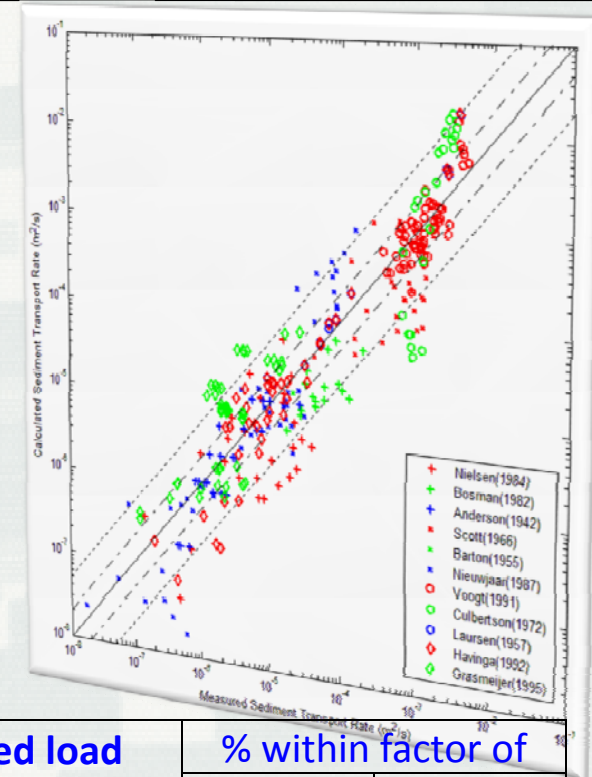


Coastal Modeling System

FY12: Improved Sediment Transport

Coastal Modeling System

- Largest source of error in modeling
- Existing formula designed for
 - Graded sediments under currents only (e.g. Wu et al. 2000) or
 - Sorted sediments under waves and currents (e.g. Lund-CIRP)
- Database being compiled
- Lab experiments
- Work benefits CIRP, DOER, RSM, +



Bed load Transport Formula	% within factor of	
	2	5
Bailard and Inman (1981)	47	70
Dibajnia and Watanabe (1992)	41	72
Ribberink (1998)	32	52
Lund-CIRP (2007)	46	74
Wu et al. (2011)	55	86

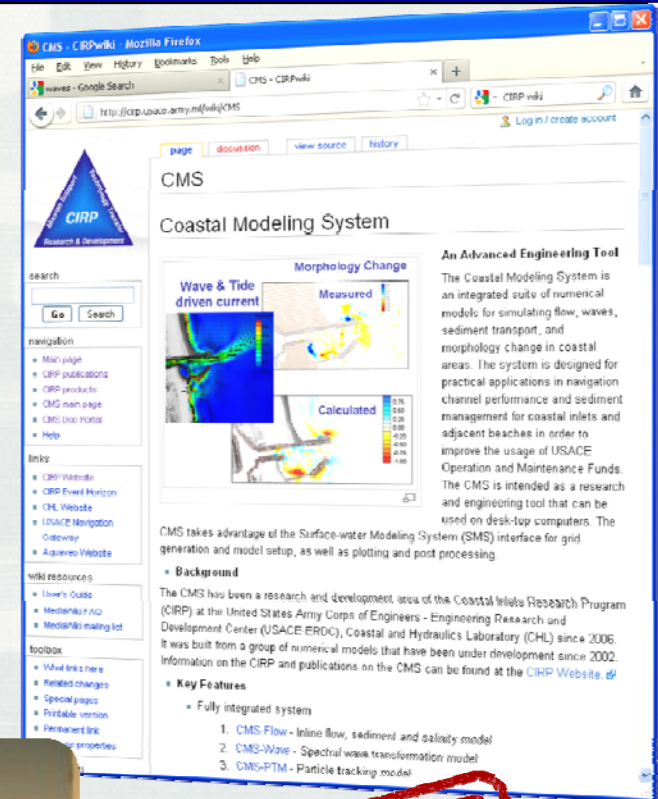
Suspended load Transport Formula	% within factor of	
	2	5
Bijker (1968)	23	52
Bailard (1968)	30	65
van Rijn (1989)	32	52
Lund-CIRP (2007)	33	65
Wu et al. (2011)	48	83

Coastal Modeling System

FY12 Technology Transfer

Coastal Modeling System

- 2 Webinars
 - Beginners (10 hrs)
 - Advanced (5 hrs)
- 1 Journal paper
 - (Norfolk, VA)
- 2 Book Chapters
 - Sediment transport theory, and applications
- 5 Conference papers
- 2 V&V TR's
- 5 CHETN's



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Coastal Modeling System

FY13 Plans

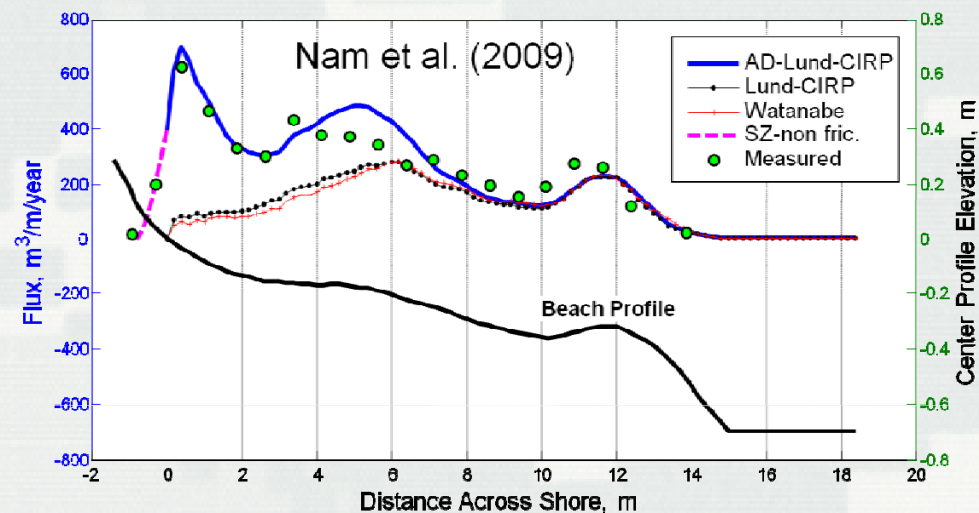
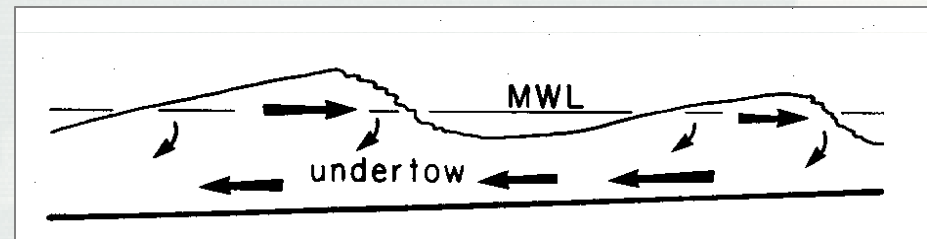
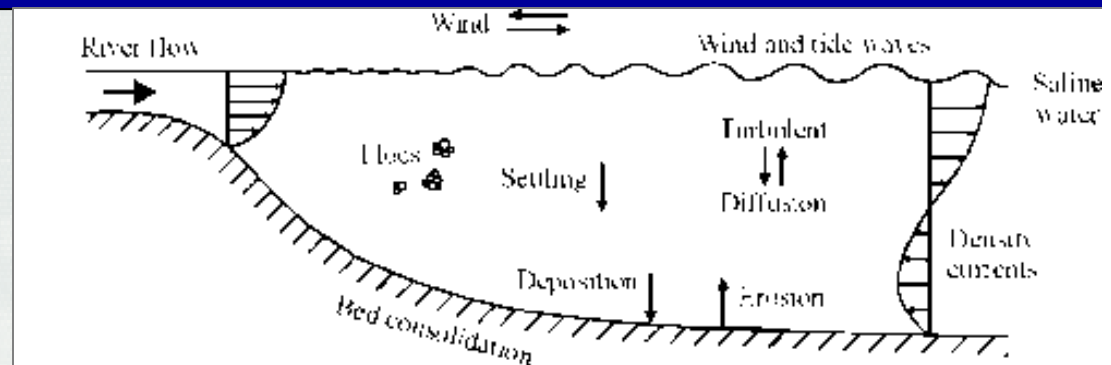
Coastal Modeling System

CMS features/updates

- Sediment Mapping
- Dredging events
- Explicit telescoping grid
- Parallelization for HPC
- Tidal potentials
- Improved Open BC's, etc

R&D

- V&V of Quasi3D
- Swash zone
- V&V of mixed sediments



Coastal Modeling System

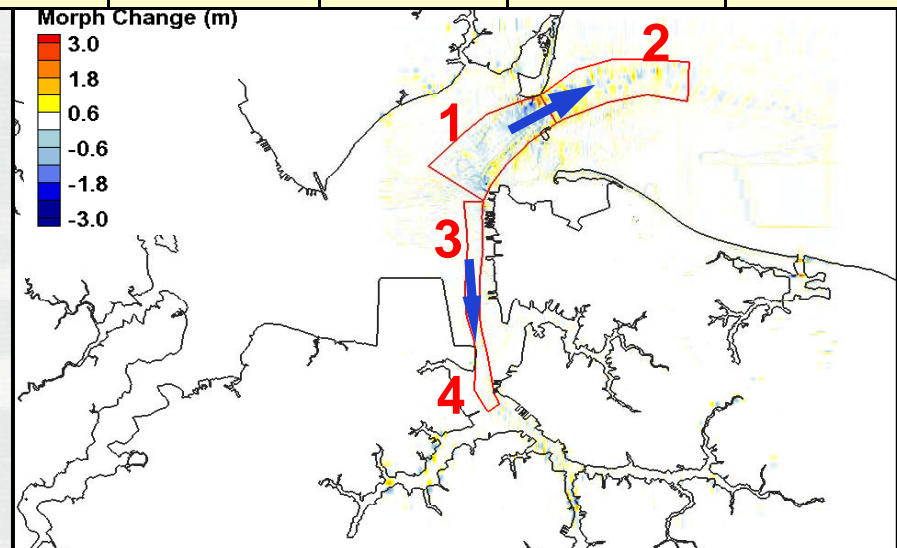
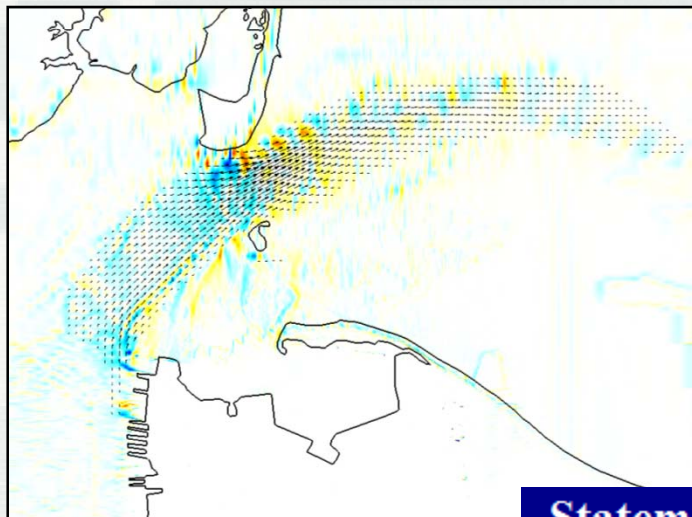
*Ongoing Application: Sea Level
Change Impacts to Navigation*

100-year return synthetic storm and sea level rise scenarios

Average sediment transport, channel
volume and bed changes in Hampton
Roads, near Norfolk, VA

→ Increased SLR increases response
(either more erosion or accretion)

Region	SLR = 0 m		SLR = 2 m	
	Volume Change (m ³)	Bed Change (m/m ²)	Volume Change (m ³)	Bed Change (m/m ²)
1	6,800	0.003	26,000	0.01
2	-18,800	-0.01	-51,000	-0.02
3	-940,000	-0.10	-1,569,000	-0.17
4	566,000	0.06	894,000	0.10



Statements of Need

CIRP Supports District Navigation Issues

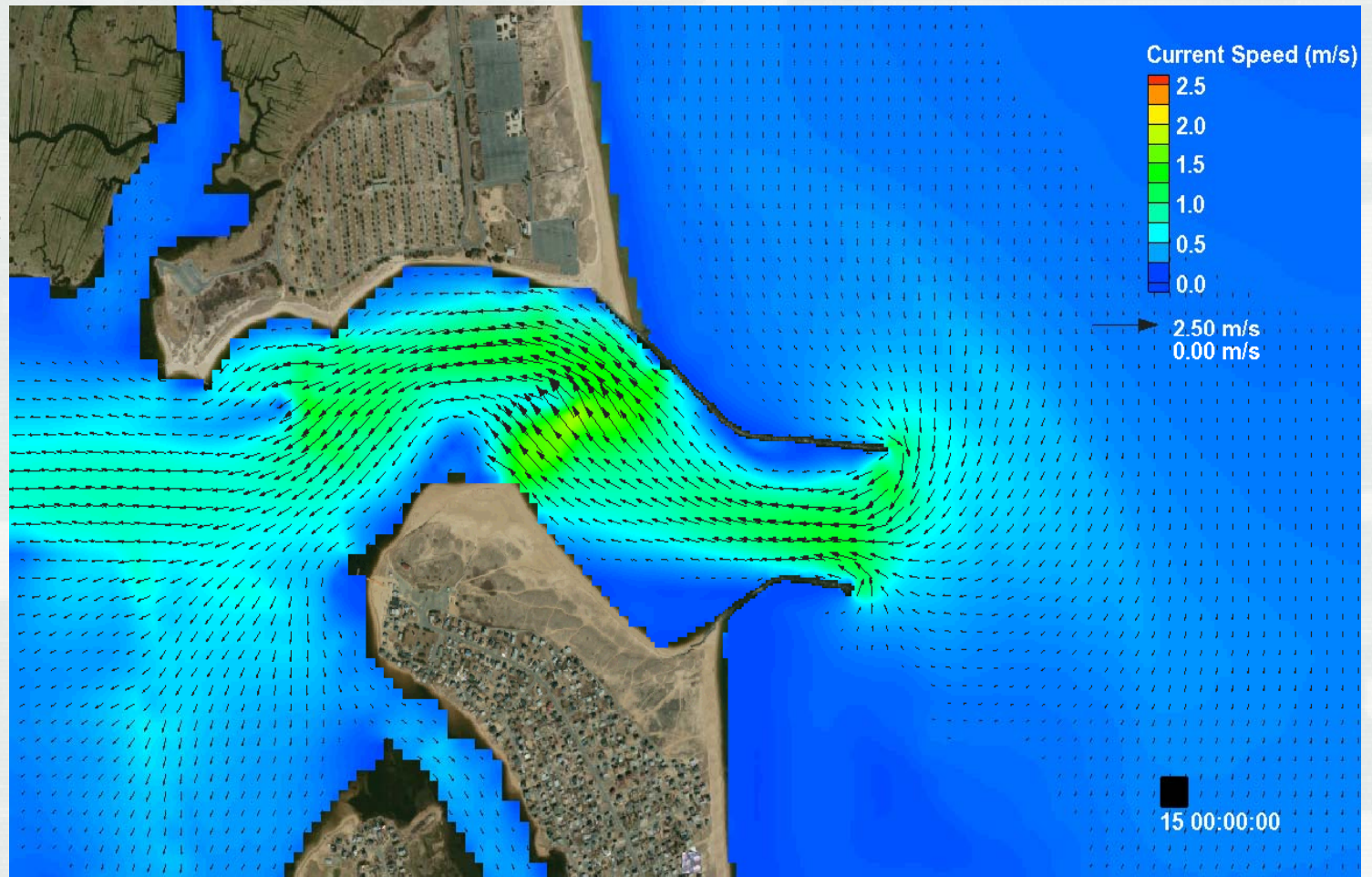
Example CMS Application, Merrimack Inlet, MA

Concerns:

- Erosion of downdrift beach
- Reduced navigability of inlet

Watch:

- Currents up to 2.5 m/sec in inlet
- 2.6-m tidal range
- Island appearing in middle of channel
- Currents thru degraded jetties may exacerbate downdrift erosion



Examining 19 Alternatives including mining ebb/flood shoal, jetty modifications, detached breakwaters

CIRP Work Units

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Waves at Navigation Structures

*Lihwa Lin
Zeki Demirbilek*

Coastal Navigation Portfolio Management

Ned Mitchell



Waves at Navigation Structures

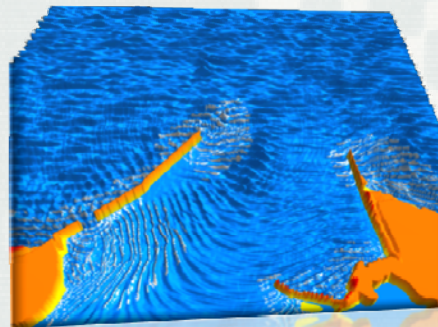
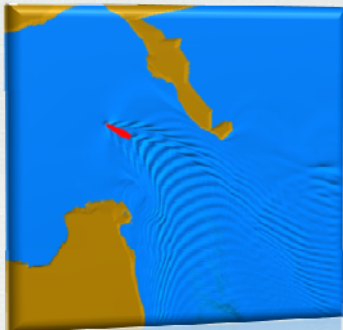
Waves at Navigation Structures

Focus: to advance wave predictive capability in support of USACE missions for coastal navigation, structures, ports/harbors/marinas, and adjacent beaches, reefs and wetlands.

CMS-Wave:

Advanced spectral wave propagation model including diffraction, reflection, run-up, setup, overtopping, wave generation, structures (breakwaters, jetties, groins, etc.), nested grids; integrated with CMS-Flow

14 Verification & Validation Cases



Report 2 - Waves

- Basic Verification for Idealized Problems
 - Ex1 - Wave generation and growth in limited fetch (~800 KB)
 - Ex2 - Nonlinear wave-wave interactions (~800 KB)
 - Ex3 - Wave diffraction at breakwater gap (~1 MB)
- Laboratory Studies
 - Ex1 - CHL Idealized inlet experiments (~8 MB)
 - Ex2 - Wave breaking experiments on a planar beach (~2 MB)
 - Ex3 - Wave runup on impermeable uniform slope (~1 MB)
 - Ex4 - Experiments for Cleveland Harbor, Ohio (~1 MB)
- Field Studies
 - Ex1 - Matagorda Bay, Texas (~110 MB)
 - Ex2 - Grays Harbor, Washington (~41 MB)
 - Ex3 - Mouth of Columbia River, WA/OR (~34 MB)
 - Ex4 - Southeast Oahu Coast, Hawaii (~7 MB)
 - Ex5 - Field Research Facility, Duck, NC (~48 MB)
 - Ex6 - Mississippi Coastal Improvement Program (~117 MB)
 - Ex7 - Waves over a submerged rock reef, Indian River County, FL (~18 MB)

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Bouss-2D:

Advanced phase-resolving wave propagation and transformation model.

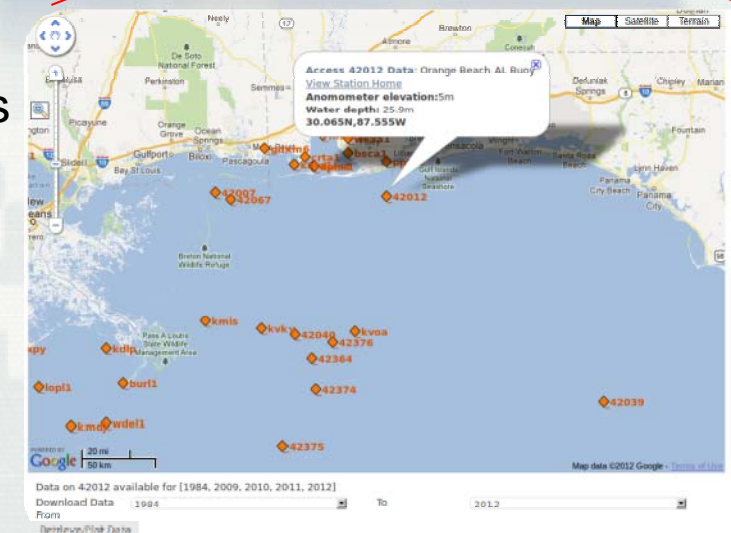
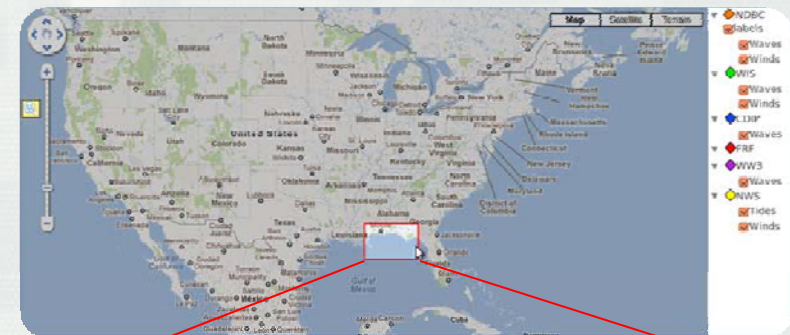
Waves at Navigation Structures: *FY12 Activities*

Metocean Data Access/Analysis: **WaveNet**

Waves at Navigation Structures

WaveNet: Web-based interactive GUI with Google Map

- Purpose: Provides data for projects and models
- Data Sources: NOAA, USGS, USACE, NAVY
- Actions: Access, process, plot, and analyze data
- Data Types: Waves, Winds, Water levels, Currents
- Future Additions: Bathymetry and Shoreline
Inlet Structures
Navigation Channels
Ports/Harbors/Marinas
Tidal Databases

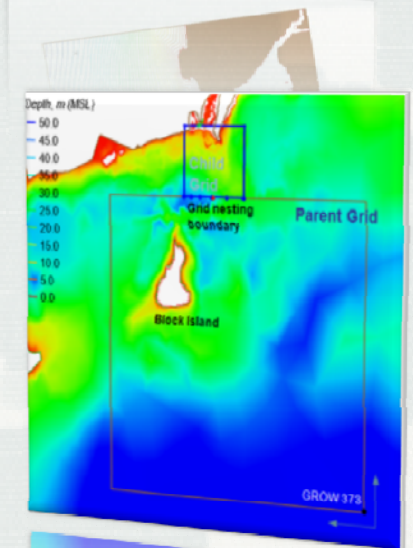
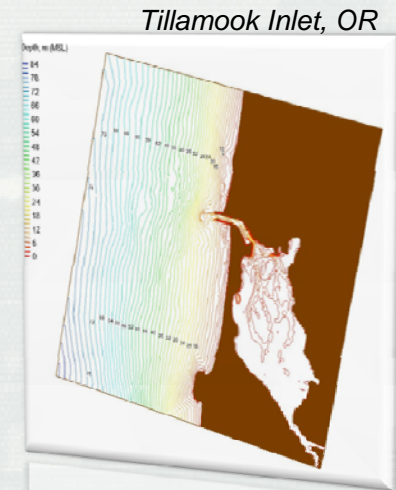


Waves at Navigation Structures

FY12 Project Applications/Reimbursables

Waves at Navigation Structures




- NWS: Grays Harbor, WA
- NWP: Tillamook Inlet, OR
- SPN: Ocean Beach San Francisco Bight, CA 
Noyo Bay, CA
Half Moon Bay, CA
- SWG: Matagorda Ship Channel, TX 
Galveston Bay, TX  MCNP
Sargent Beach, TX
- NAE: Point Judith Harbor, RI
Merrimack Inlet, MA
- NAN: Ambrose Channel, NY
- SAJ: St. Johns River, FL
St. Augustine Inlet, FL 
- POH: North Kahola Harbor, HI
Kikiaola Harbor, HI

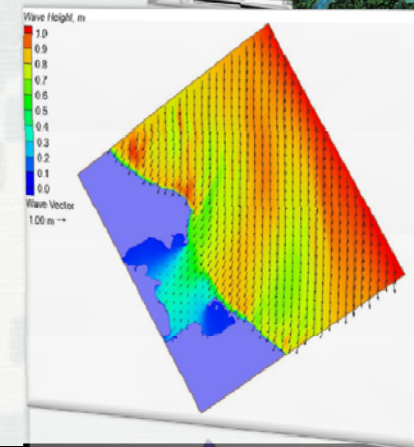
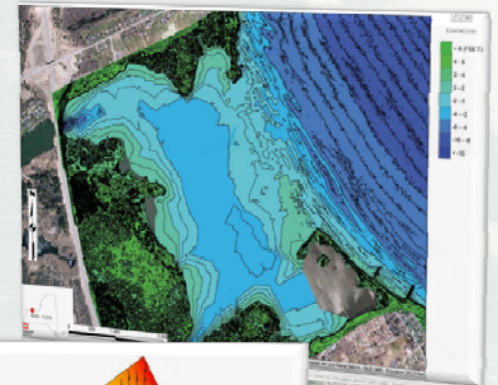


Waves at Navigation Structures

FY13 Plan

Waves at Navigation Structures

- TR: Regional and Nearshore Wave Modeling at Point Judith Harbor, RI
- CHETN: Advanced Numerical Wave Modeling for Reefs
- TR: Matagorda Bay Channel Shoaling Study, TX 
- CP: Littoral Transport Modeling of Ocean Beach and San Francisco Bight, CA 
- JP: Numerical Modeling of Coastal Inundation and Sedimentation by Storm Surge, Tides, and Waves at Norfolk, Virginia, USA
- CHETN: WaveNet Part II: Other Data Sources
- CHETN: WaveNet and GenCade Coupling
- CHETN: Coupling of CMS-Wave to AIS
- TR: Wave, Circulation, and Sedimentation Study at Braddock Bay, NY
- TR: Storm Waves, Circulation, and Sedimentation Study at Dana Point Harbor, CA
- CP: Mixed Sediment Modeling for Matagorda Ship Channel, TX 
- CP: Numerical Modeling of Coastal Dredged Material Placement Study at Noyo Harbor, CA



CIRP Supports District Navigation Issues

Example: Tillamook Inlet, OR

Waves at Navigation Structures

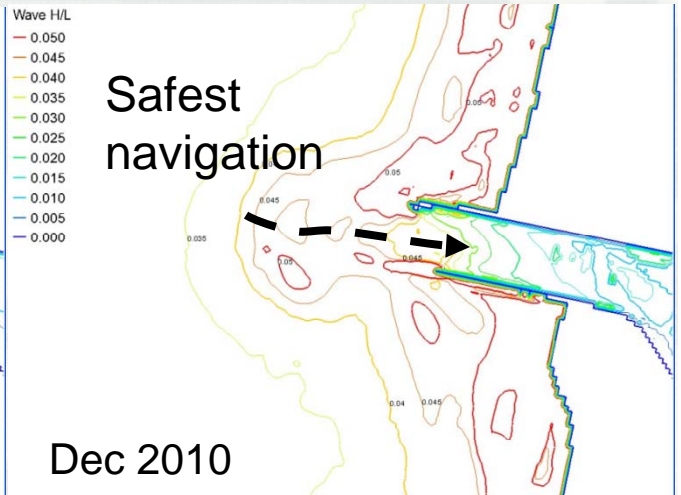
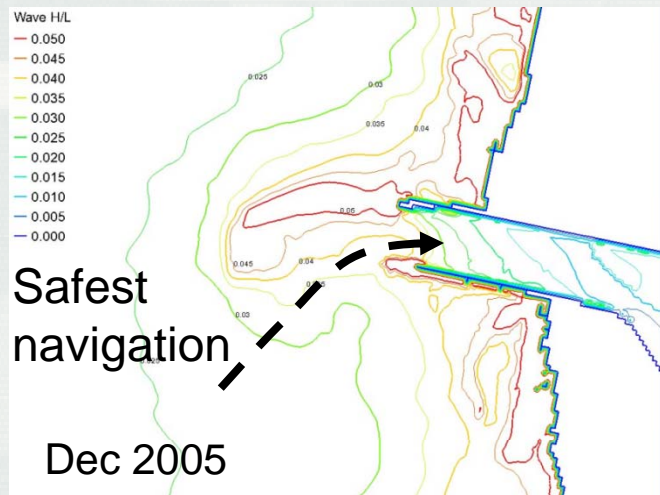
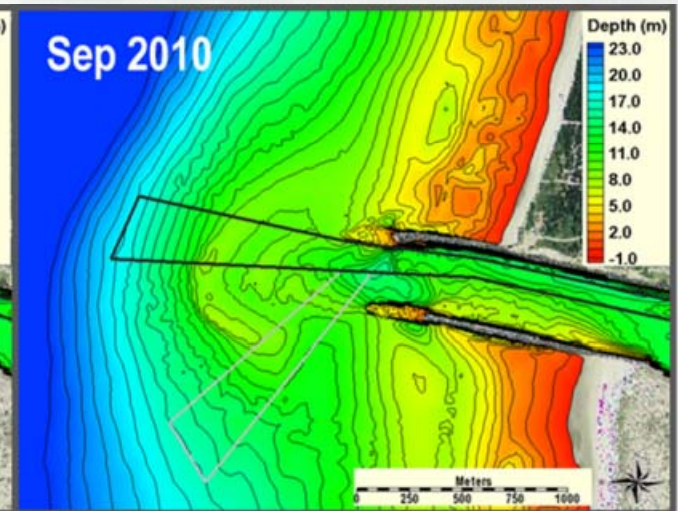
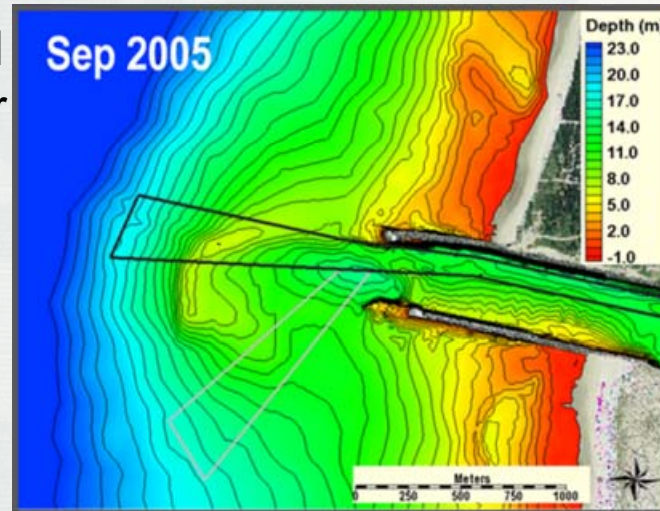
Purpose:

- Quantify hazard and risk levels for navigation

- Evaluate wave and current condition near degraded jetties

Conditions:

- Currents up to 6 kt in inlet
- 1.9-m tidal range
- High wave energy coast
- Seasonal migration of large ebb shoal
- Increased wave breaking and current flow at submerged relic jetty sections



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FY12 Accomplishments

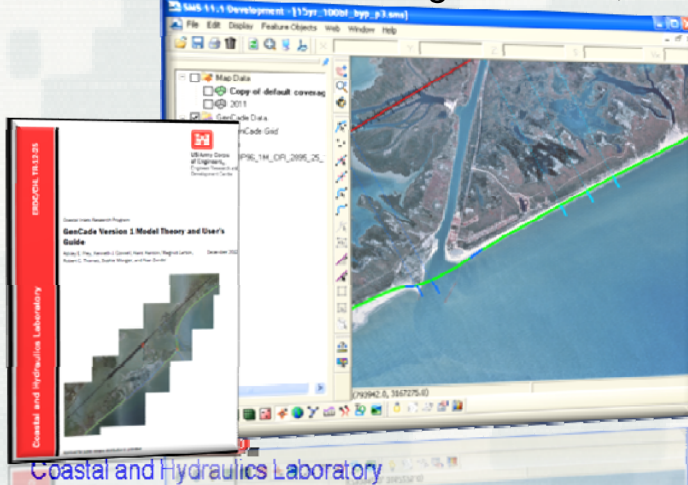
Inlet Engineering Toolbox

Focus: develop desktop PC and web-based tools to assess how engineering actions affect coastal inlets, navigation channels, and adjacent beaches

GenCade

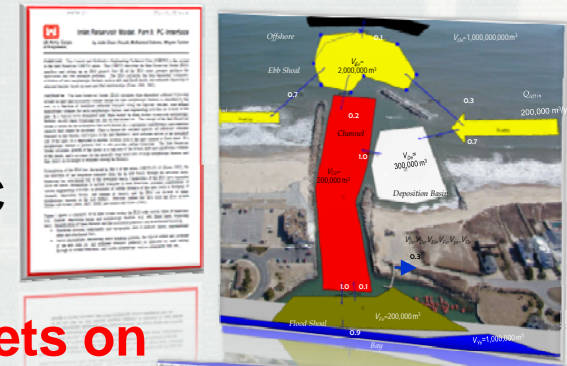
- A 1-line model for shoreline change, sand transport, and inlet sand sharing
- Based on GENESIS (project scale) and Cascade (regional scale)
- GenCade Version 1 released in FY12
- GenCade available in SMS 11.1 Beta
- Published TR: Theory and Users Guide

GenCade at Sargent Beach, TX



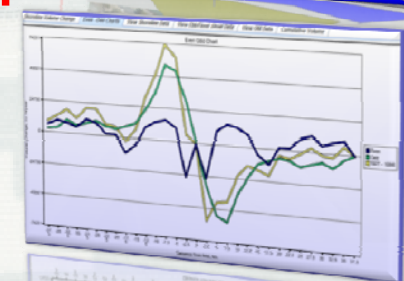
Inlet Reservoir Model

- PC-based, time-dependent sand sharing model for inlet morphologic evolution
- CHETN on PC interface



Impacts of Inlets on Adjacent Beaches (IIAB) application

- Calculates alongshore extent of inlet influence (CEM method) and total volumetric impact of inlet



Statements of Need

Need long-term morphologic evolution predictors
Tracking Number 2008-N-6

Inlet Engineering Toolbox FY12-13 Accomplishments

Inlet Engineering Toolbox

GenCade

Completed GenCade studies at 3 sites:
St. Johns County, FL (TR-12-14: Report 3)
Onslow Bay, NC (CHETN-IV-85)
Sargent Beach and Matagorda Peninsula (TR in editing)

- Wiki documentation enhanced activities

16 - 18 October 2012 - Gencade

Overview

16 October 2012 - Day 1

- [Welcome](#)
- [Introduction to GenCade](#)
- [Introduction to GenCade in the SMS](#)
- [Helpful Hints](#)
- [GenCade Applications](#)
- Completed Project Demo
- Simple Case Demo

17 October 2012 - Day 2

- Simple Case Demo (continued)
- [Inlets and Beach Fills Case](#)
- Complex Case (start)

18 October 2012 - Day 3

- Complex Case (continued)
- [Future Capabilities](#)
- [Wave Conversion Tool](#)

Files

Click underlined links on the agenda to access presentation material, CMS User's Guide, and data files.

- [GenCade Executable](#)
- SMS 11.1 Beta (Full Installation)
 - [32-bit Installer](#)
 - [64-bit Installer](#)
- [Day 1 material](#)
- [Day 2 material](#)
- [Day 3 material](#)

Webinar Audio/Video Files

- [Day 1 \(~100 MB\)](#)
- [Day 2 \(~113 MB\)](#)
- [Day 3 \(~ 75 MB\)](#)

Links

- [CIRP Website](#)
- [CHL Website](#)
- [USACE Navigation Gateway](#)
- [Aquaveo Website](#)
- [Wiki resources](#)

Toolbox

- [What links here](#)
- [Related changes](#)
- [Special pages](#)
- [Permanent link](#)

Figure 1. Combination of GENESIS and Cascade

GenCade

1. GenCade

ERDC/OIL TR-12-14

Coastal Inlets Research Program

Optimization of Ebb Shoal Mining and Beach Nourishment at St. Johns County, St. Augustine Inlet, Florida

US Army Corps of Engineers
Engineer Research and Development Center

GenCade Application at Onslow Bay, North Carolina
by Ashley E. Frey, Sophie Munger, Greg L. Williams, Michael Witkowski, and Kevin B. Con

PURPOSE: This Coastal and Hydraulics Engineering Technical Note (CHETN) describes the setup and results of a regional sediment transport analysis of Onslow Bay, North Carolina performed using GenCade Version 1.1. GenCade is a regional shoreline and inlet sand size model results of sediment transport analysis (GenCade) using beach nourishment.

GenCade Applications

Ashley Frey
Research Civil Engineer, Co-PI of the Inlet Engineering Toolbox work unit of CIRP

US Army Corps of Engineers

ERDC
Engineer Research and Development Center

Index of /webinars/101612-Files/Day1

Name	Last modified	Size	Description
Parent Directory		-	
Day1-1 Welcome.pdf	16-Oct-2012 13:48	200K	
Day1-2 GenCadeIntro.pdf	16-Oct-2012 13:48	1.1M	
Day1-3 GenCade SMS comp.pdf	16-Oct-2012 13:48	2.4M	
Day1-4 Docs Help.pdf	16-Oct-2012 13:48	1.5M	
Day1-5 Applications comp.pdf	16-Oct-2012 13:48	6.4M	
Simple Example/	16-Oct-2012 13:47	-	



Inlet Engineering Toolbox

FY13 Plans

Inlet
Engineering
Toolbox

GenCode

Guidance Documentation

- Recommendations & requirements (TR, extension of Model Theory TR)
- Site-specific guidance
 - ✓ Definition of "region"
 - ✓ Pre-calibration assessment
 - ✓ Standard procedure for calibration
 - ✓ Purposes & goals of calibration & validation
 - ✓ Statistics
- Lateral boundary conditions (CHETN)

Wave Conversion Tool (2 CHETNs in review)

CMS-Wave

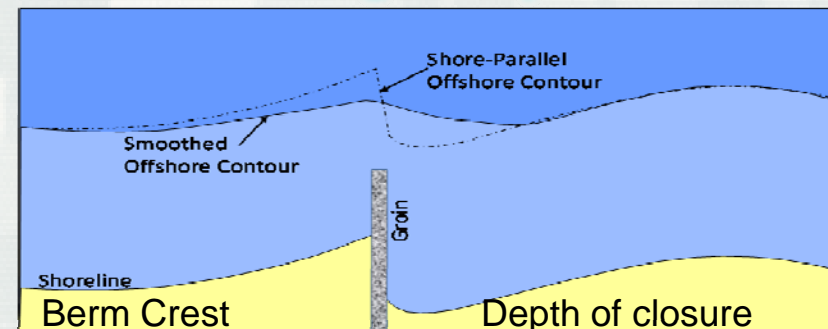
Wind input, wave generation & growth, wave transformation, diffraction, reflection, run-up, setup, overtopping, structures, surface roller



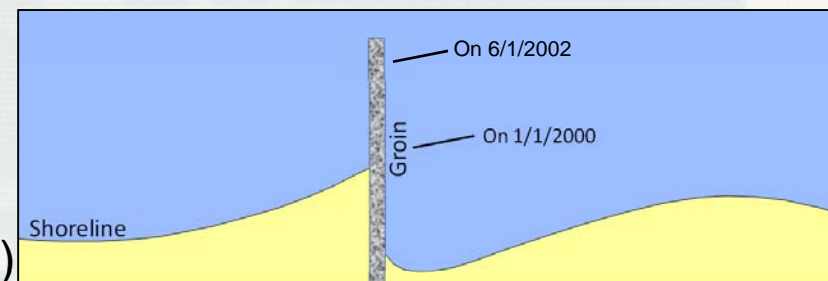
GenCode

Option for GenCode to accept forcing from an external wave model

Variable alongshore parameters



Variable structures in time



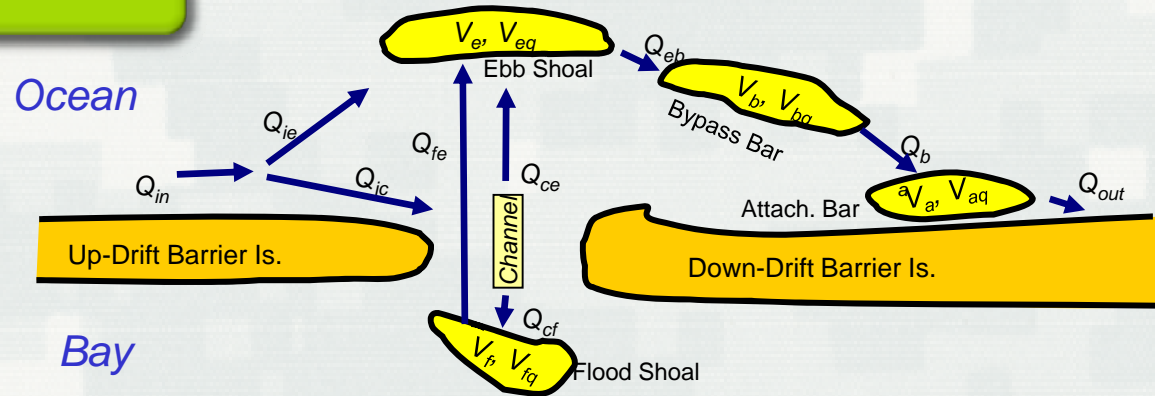
Inlet Engineering Toolbox

FY13-14 Plans

Inlet
Engineering
Toolbox

GenCade

Improve Inlet Reservoir Model in GenCade



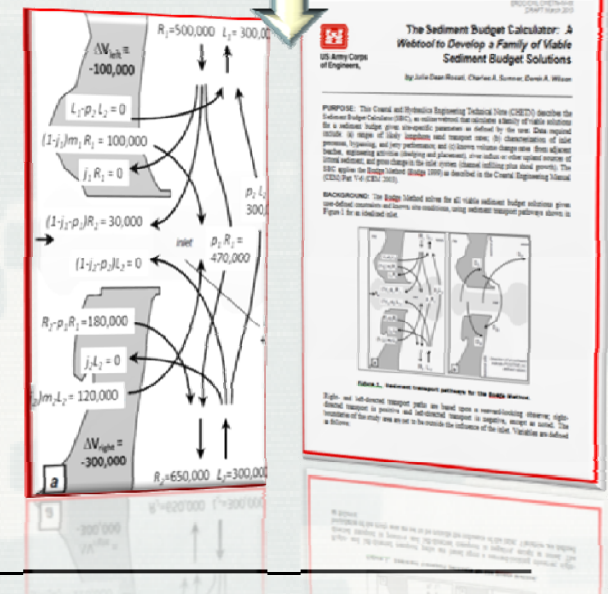
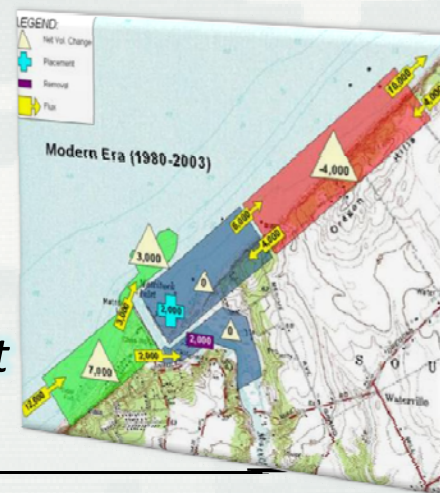
Sediment Budget Calculator

- CEM (Bodge) Method to develop Family of Solutions for sediment Budgets
- Web Tool and TN

GenCade

SBAS Arc10

GenCade output used as input to create an SBAS Calculated Sediment Budget



CIRP Work Units

Program Management and Technology Transfer

Julie Rosati, Mitch Brown

Coastal Modeling System (CMS)

*Alex Sanchez
Honghai Li*



Waves at Navigation Structures

*Lihwa Lin
Zeki Demirbilek*

Geomorphic Evolution

Tanya Beck

Inlet Engineering Toolbox

*Ashley Frey
Julie Rosati*

Coastal Navigation Portfolio Management

Ned Mitchell

Geomorphic Evolution

FY12 Accomplishments

Geomorphic Evolution

Develops methods and context for studies on federal navigation and coastal projects over time scales much greater than dredging cycles, planning timelines, and the dimensions of the navigation channel.

Products

Characterized
Environments
for Nearshore
Berm
Prediction

Documentation
& Guidance

Numerical
Modeling



Statements of Need

Design and Evaluation Tool for Nearshore Berm Placement of Non-Beach Compatible Material
Tracking Number 2011-N-15

Nearshore Placement of Dredged Sediment Assessment
Tracking Number 2011-N-19

Statements of Need

Identifying and Addressing Potential Sea Level Change Impacts to Navigation Projects
Tracking Number 2013-N-11

Statements of Need

Need long-term morphologic evolution predictors
Tracking Number 2008-N-6

Sediment

Geomorphic Evolution FY12 Accomplishments

Monitoring Nearshore Berms in Collaboration with SAJ & SAM



- Perdido Key: Monitored Starting Jan 2013
- Egmont: Starting Sep 2012
- New Smyrna Beach: Started Aug 2012 (Complete)
- Ft. Myers Beach: Monitored since May 2010 (Complete; Starting Oct 2012)



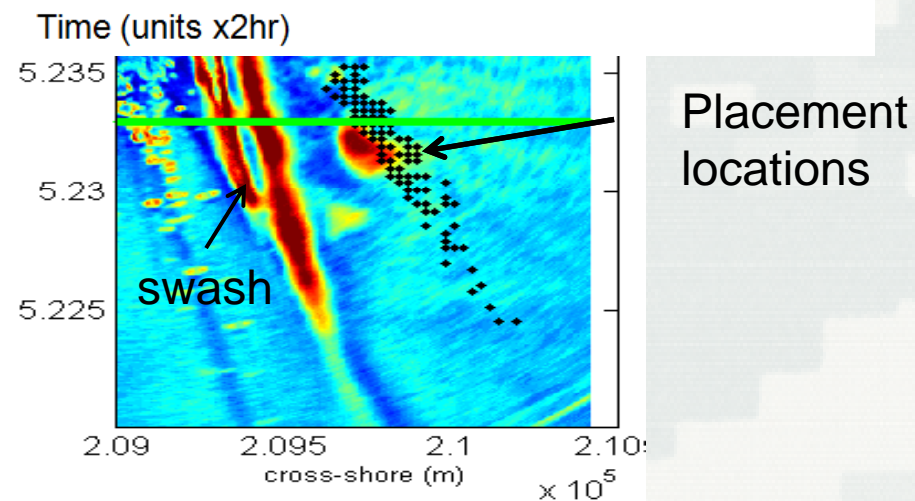
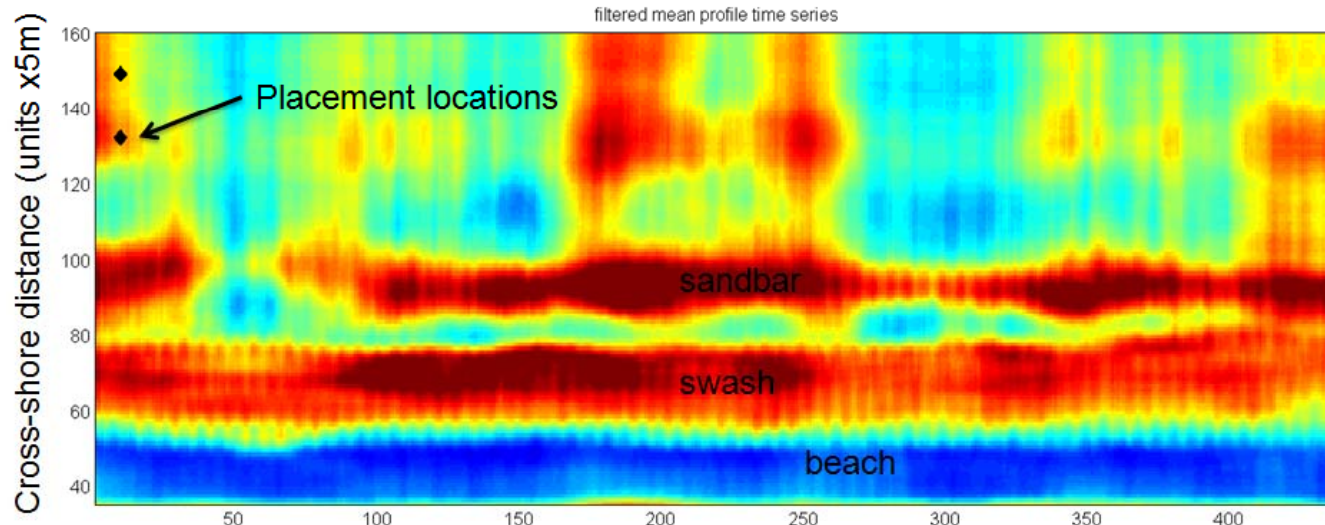
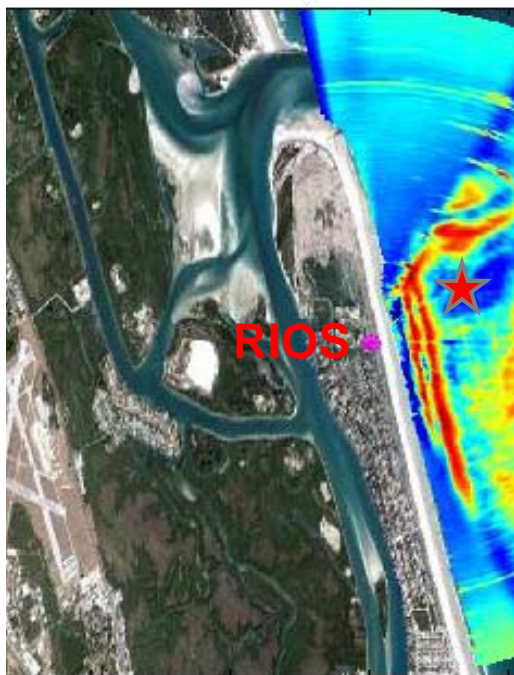
Geomorphic Evolution

FY12 : New Smyrna Nearshore Placement (Aug 2012)



www.offshoreswell.com

25-Sep-2012 10:00:00



Inlet Geomorphology

FY13 Plans: Release NBC V 1.0

- **Planning-Scoping Tool**
- **Estimates placement depth (based on wave-limited cross-shore transport)**
- **Calculates position and design from user-defined parameters and coastal engineering design practices**
- **Automated wave parameter extraction; user-defined beach profile; draft depth and placement limitations based on dredge**

st:3141/Berms/Calculate

Nearshore Berm Calculator

Home Calculator Background Definitions References Contact Login

Nearshore Berm Calculator

General Beach Waves Dredging & Placement Type Placement Depth Placement Location

US

Estimate of Width ft

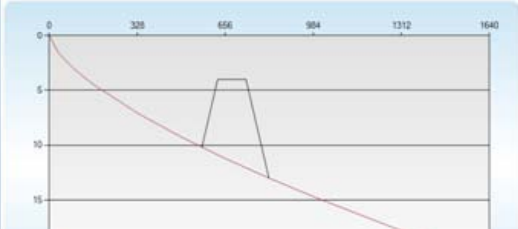
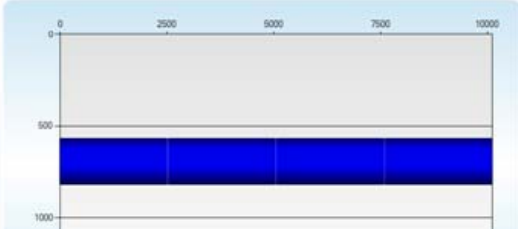
Estimate of Area ft²

Predicted Length of Given Crest Height ft

Suggested Length ft

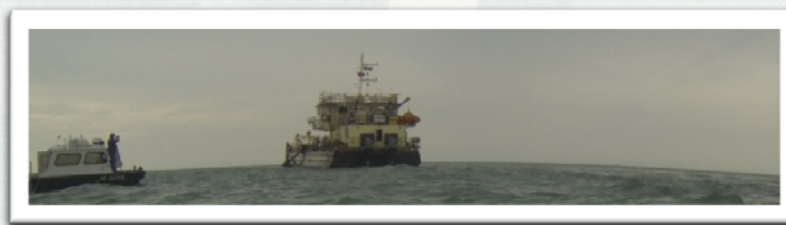
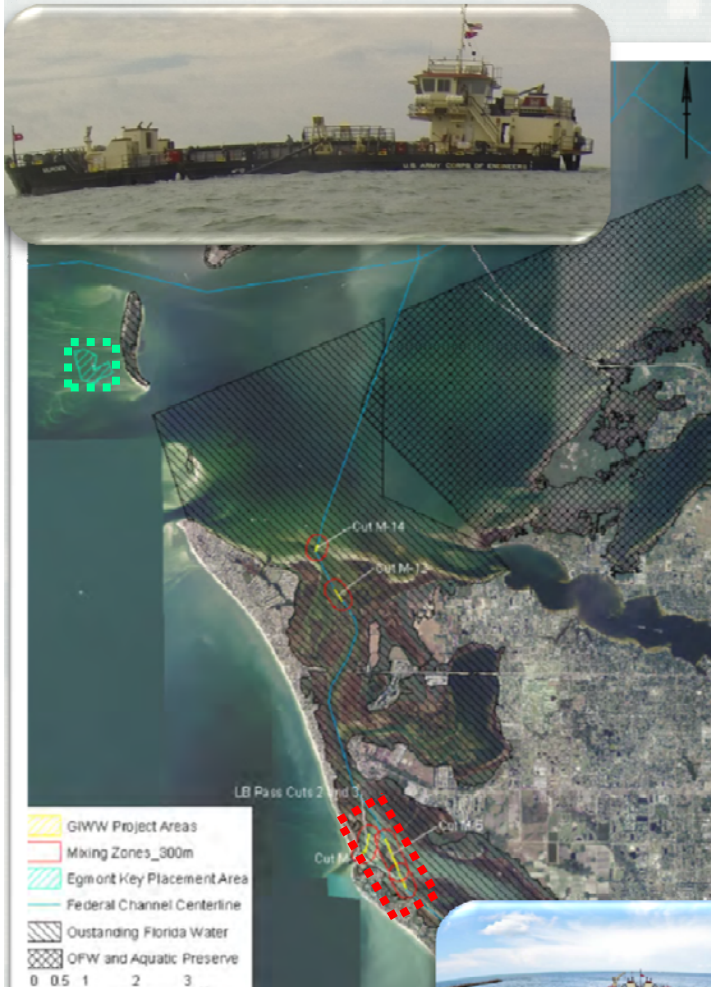
Segmented Count

Segmented Length (each) ft

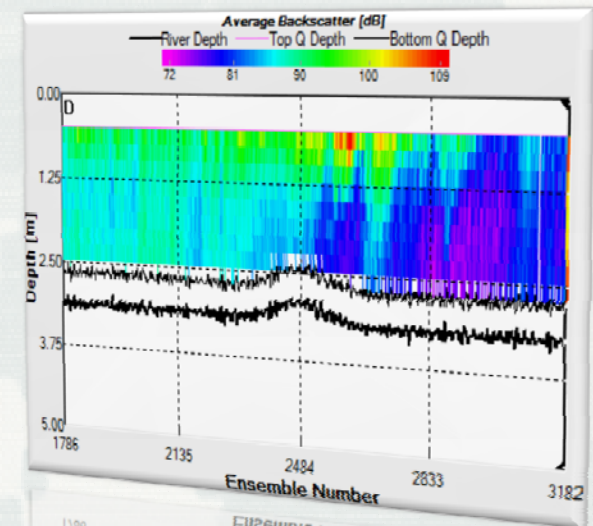



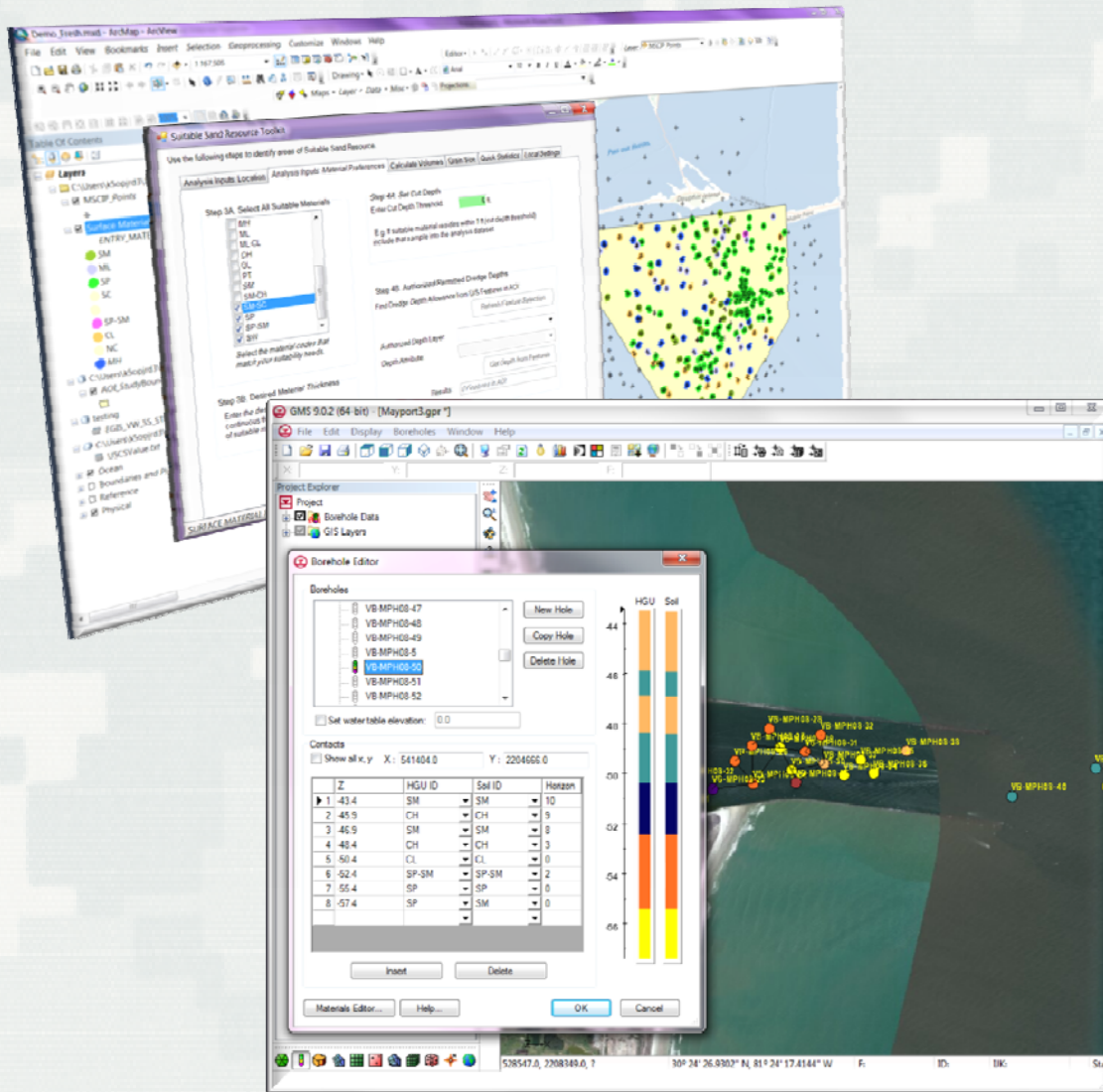
Geomorphic Evolution

FY13: Field Monitoring Study of GIWW Dredging and Nearshore Placement at Egmont Key



- ADCP Currents
- ADCP Backscatter
- Total Suspended Solids
- Turbidity Sensor Array
- Wave Array
- Light Attenuation
- Surface Sediment





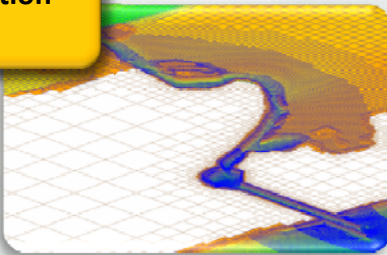
- Develop a standard web-service linked to individual District Servers to serve out sediment data into a common format
- Web Application version of data submission form feeds directly to NCDB
- Integrated to GMS, and designed to provide 3D sedimentologic input for SMS numerical models

Geomorphic Evolution

FY13 Plans: Modeling Methodology for Design of Nearshore Berms

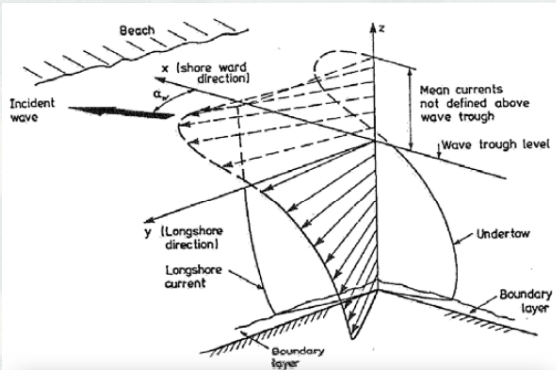
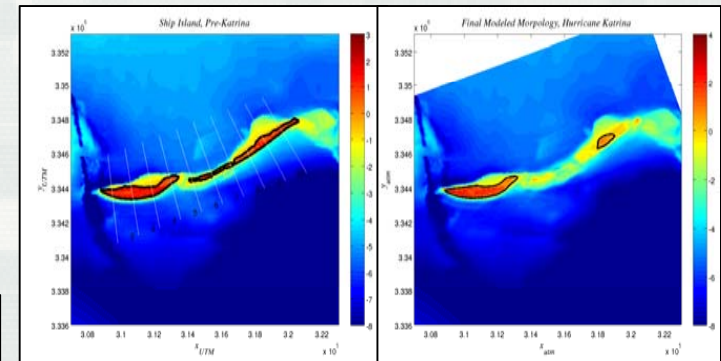
Geomorphic
Evolution

CMS

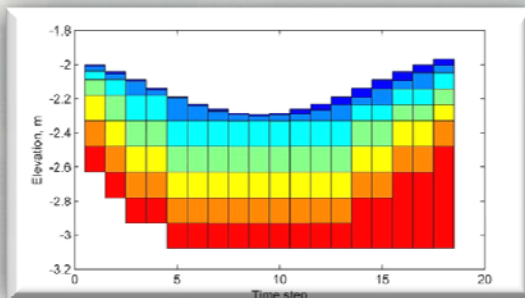
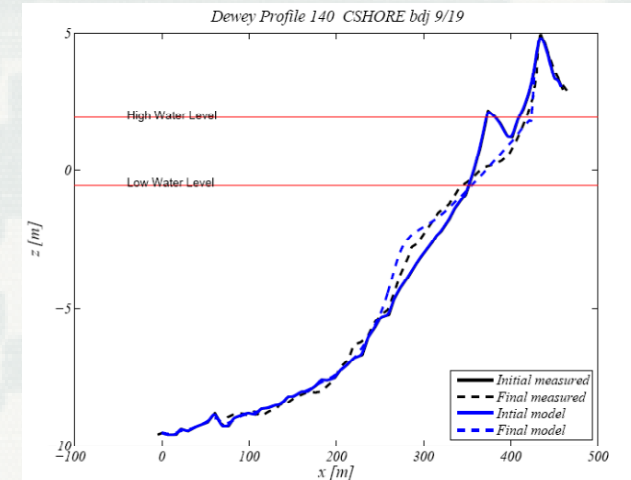


← Validated 2DH Coastal Model that simulates vertical variation of horizontal velocities and includes mixed sands

CShore



Surf Zone Processes in Both Models:
Undertow
Stokes Drift
Wave Asymmetry
Separated Bed and Suspended Load



1D Coastal Model → validated for erosion/accretion in the cross-shore for both East and West Coast Applications

CIRP Summary

<http://cirp.usace.army.mil>

- All products & documentation available on website and wiki
- CIRP available to travel to your District and provide training on products
 - CIRP travel and labor free (until funding runs out)
- We invite suggestions for improvement, new methods for technology transfer, and challenging inlet applications

New Initiatives with CIRP assistance:

- Corps of Engineers Coastal Engineering Certification (CECEC) Program
- FRF Field Experiment with Nearshore Berm

